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METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
IRRADIATED WITH LASER LIGHT

Inventors: Paul E. Denney et al Filed.: March 18, 2004

Atty Docket: LOMASR.026CP1

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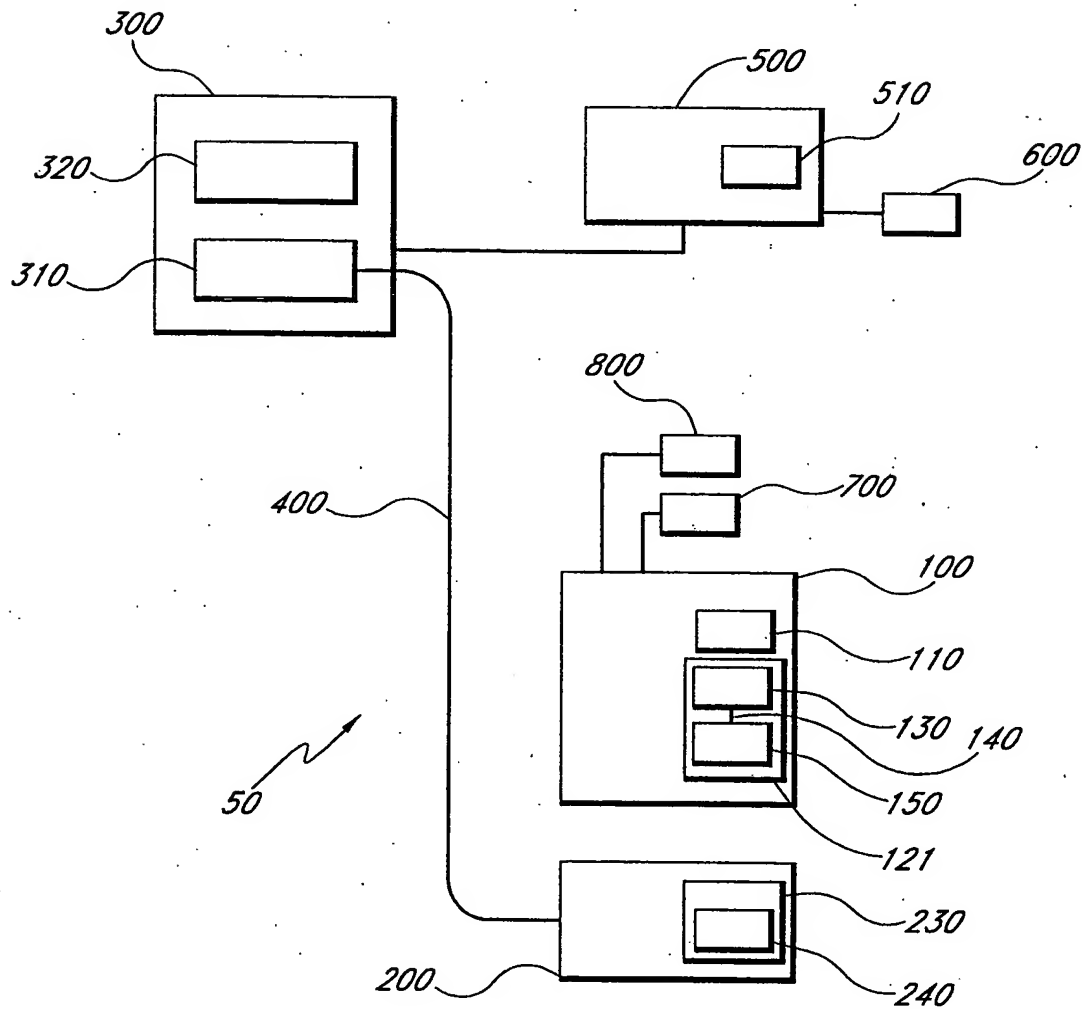


FIG. 1

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
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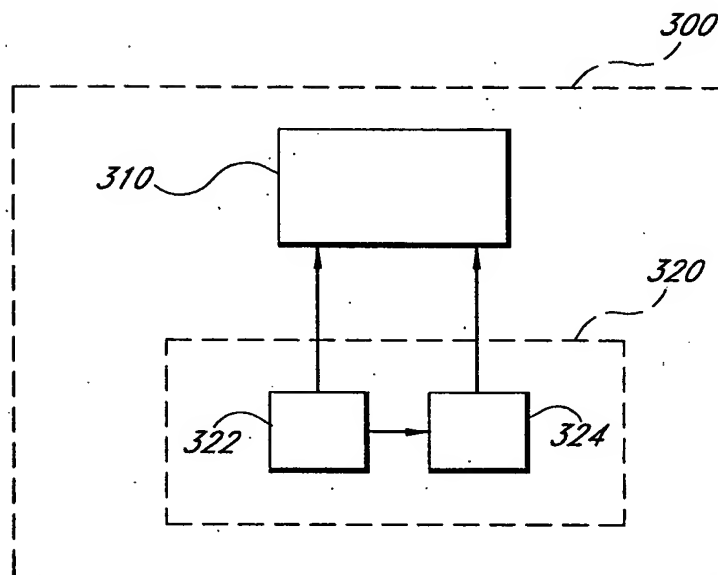


FIG. 2

**METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
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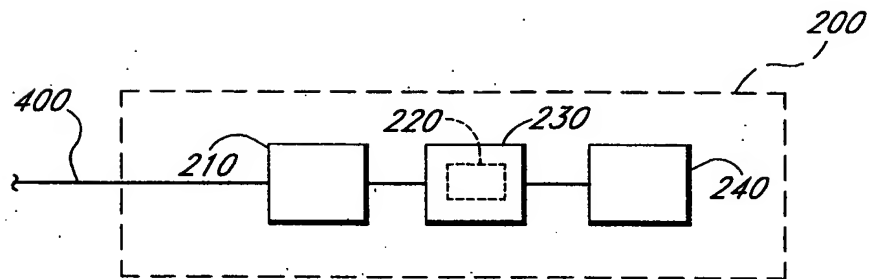


FIG. 3A

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
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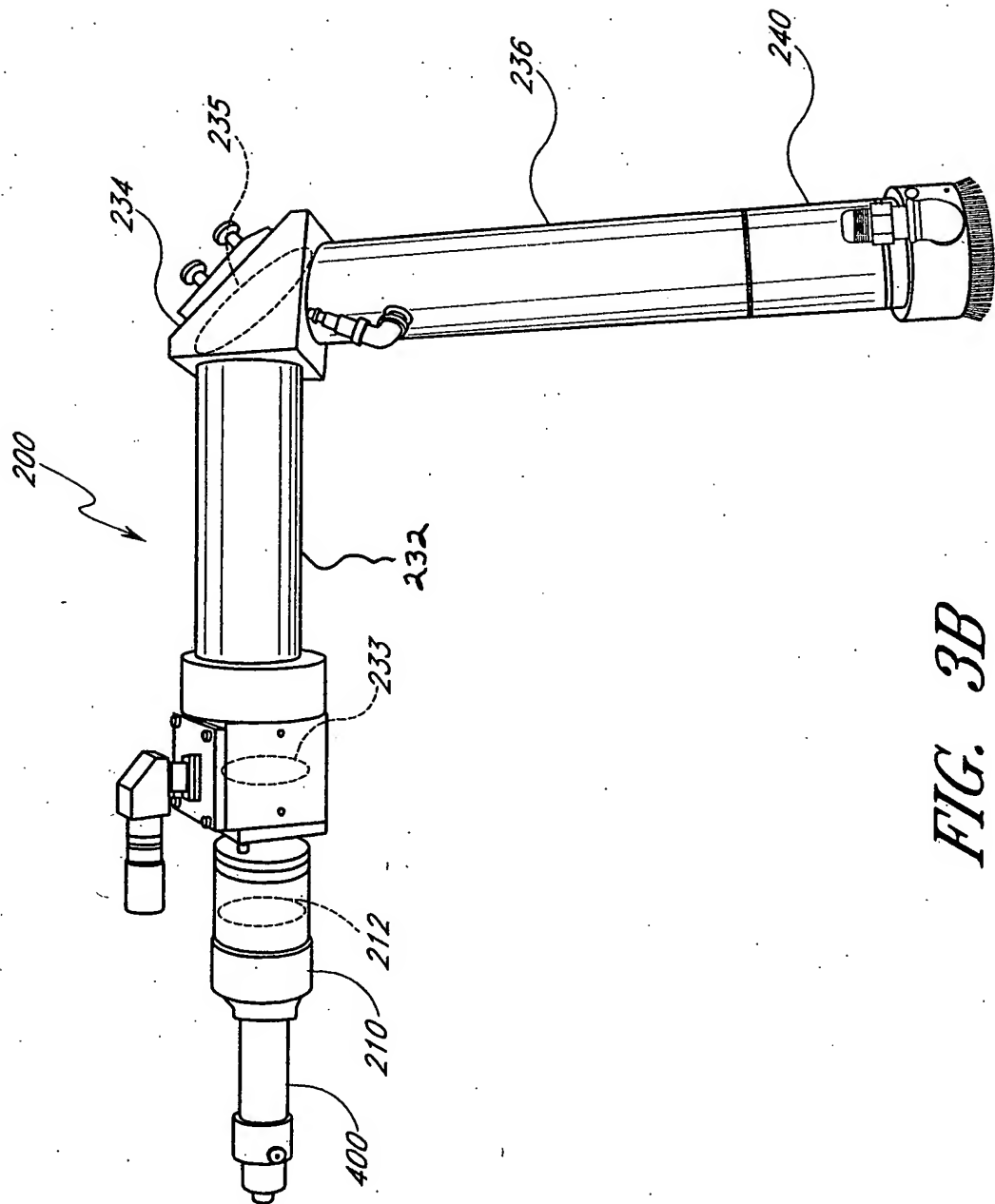


FIG. 3B

**METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
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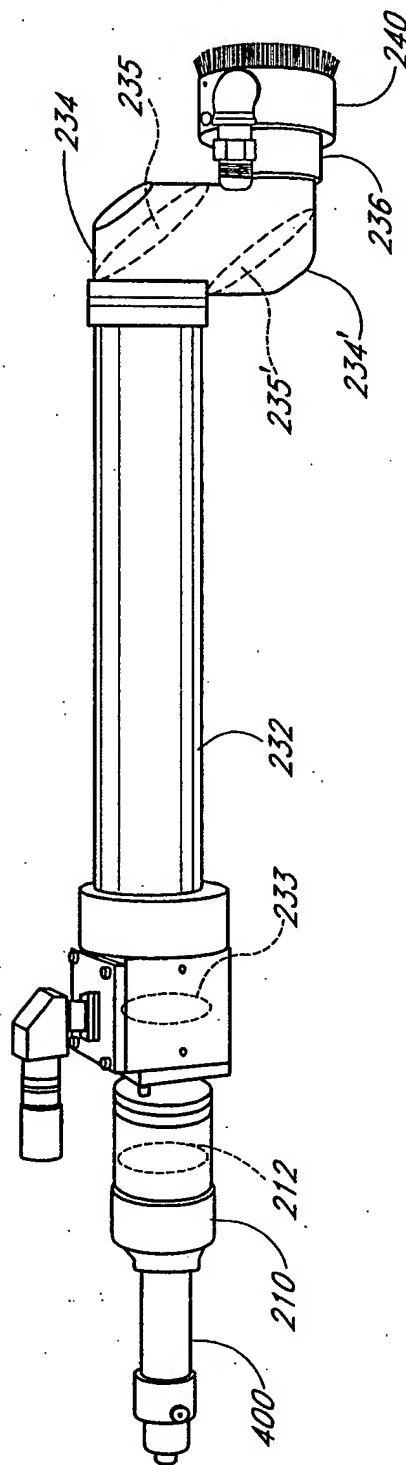


FIG. 3C

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
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Inventors: Paul E. Denney et al Filed.: March 18, 2004

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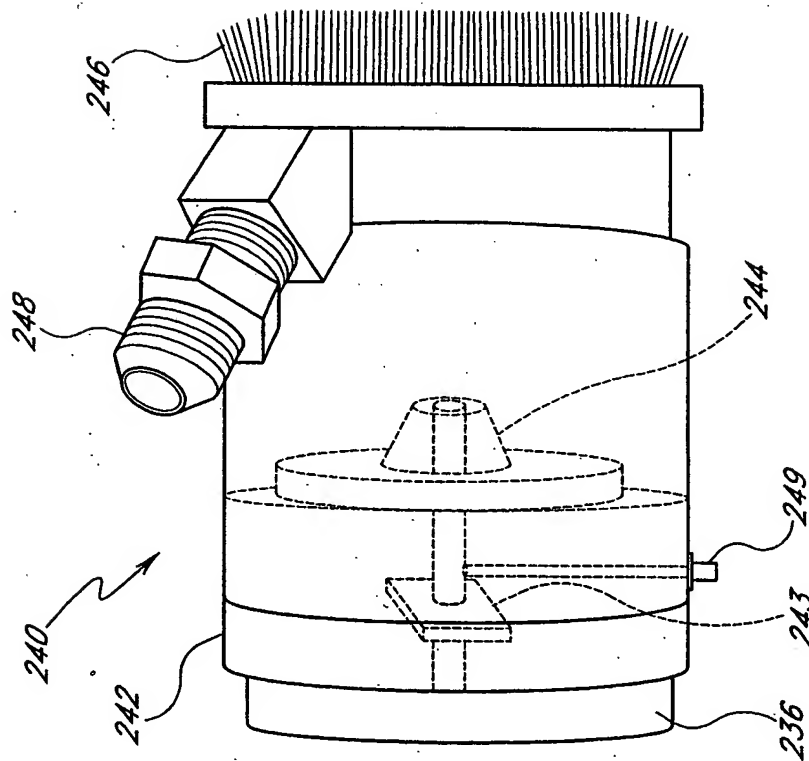


FIG. 4

**METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
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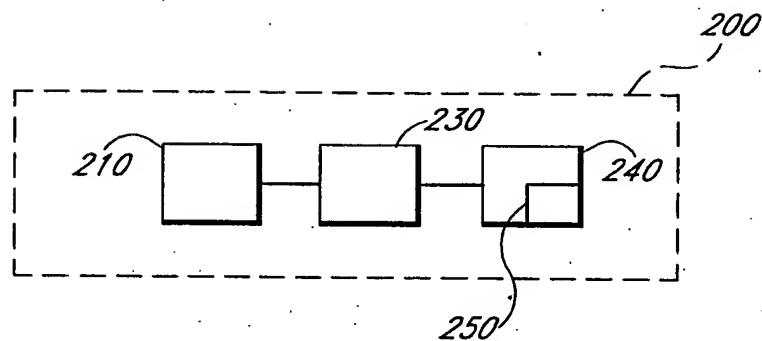


FIG. 5

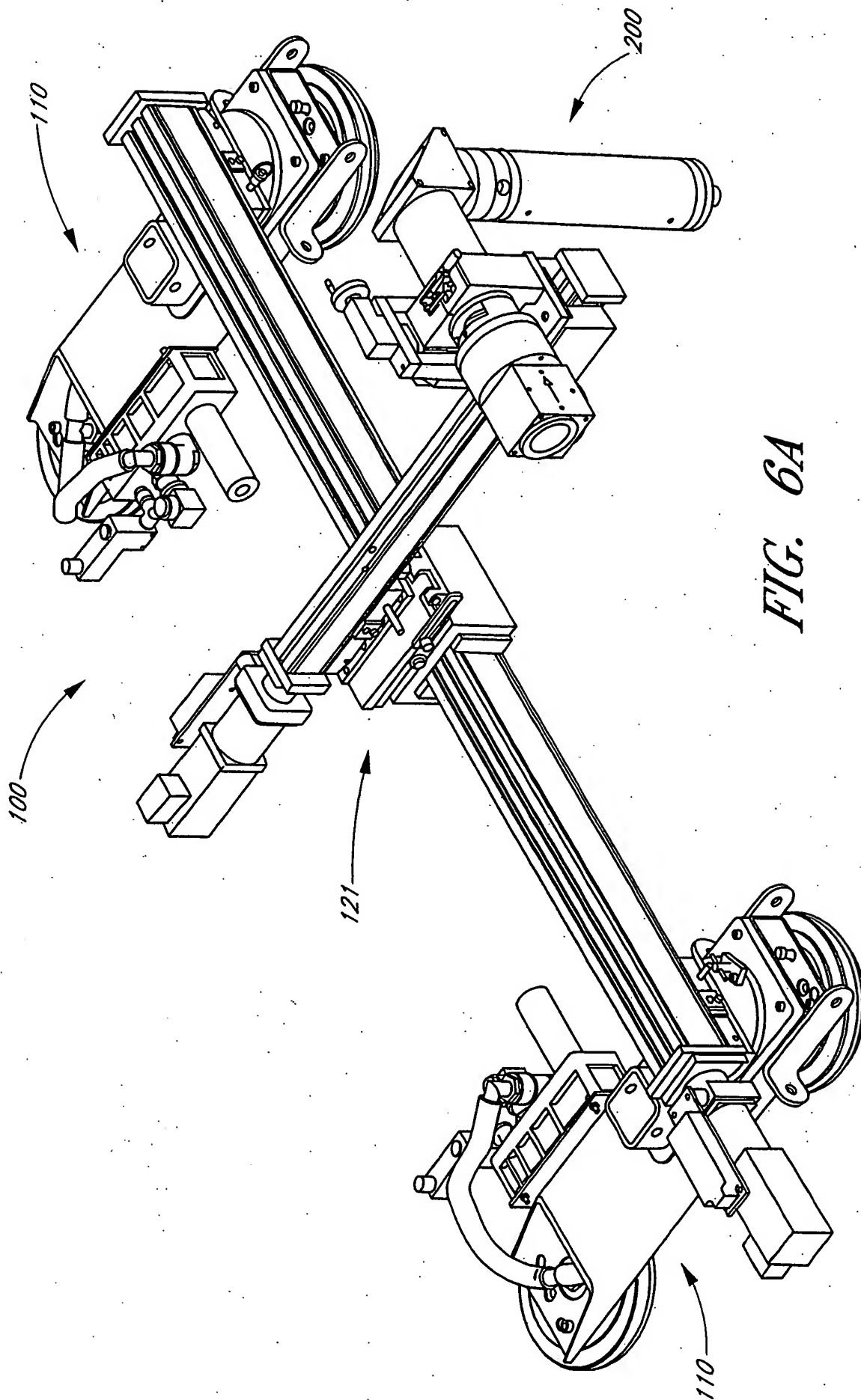


FIG. 6A

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
 WITHIN AN INTERACTION REGION OF A STRUCTURE
 IRRADIATED WITH LASER LIGHT
 Inventors: Paul E. Denney et al Filed: March 18, 2004
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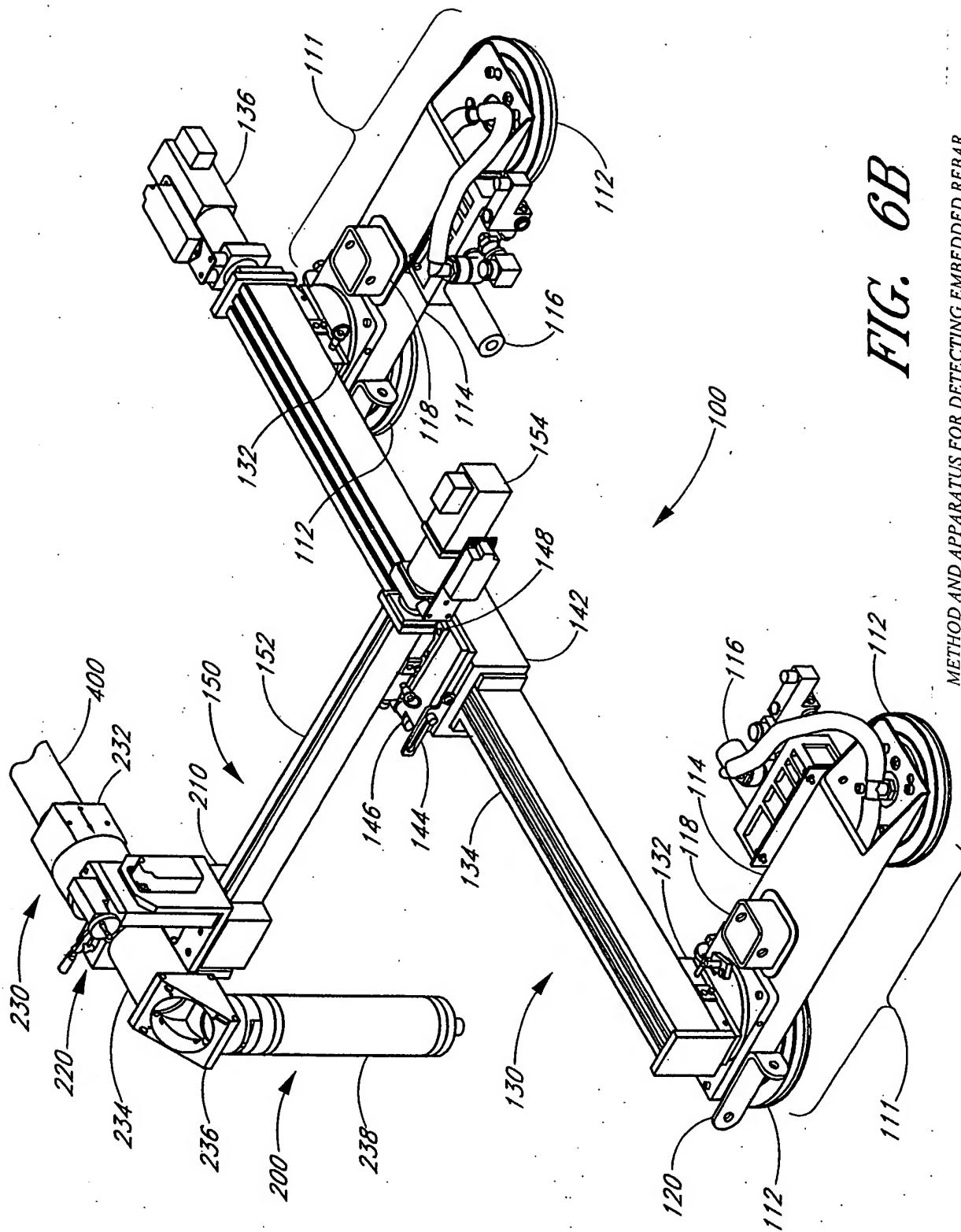


FIG. 6B

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
 WITHIN AN INTERACTION REGION OF A STRUCTURE
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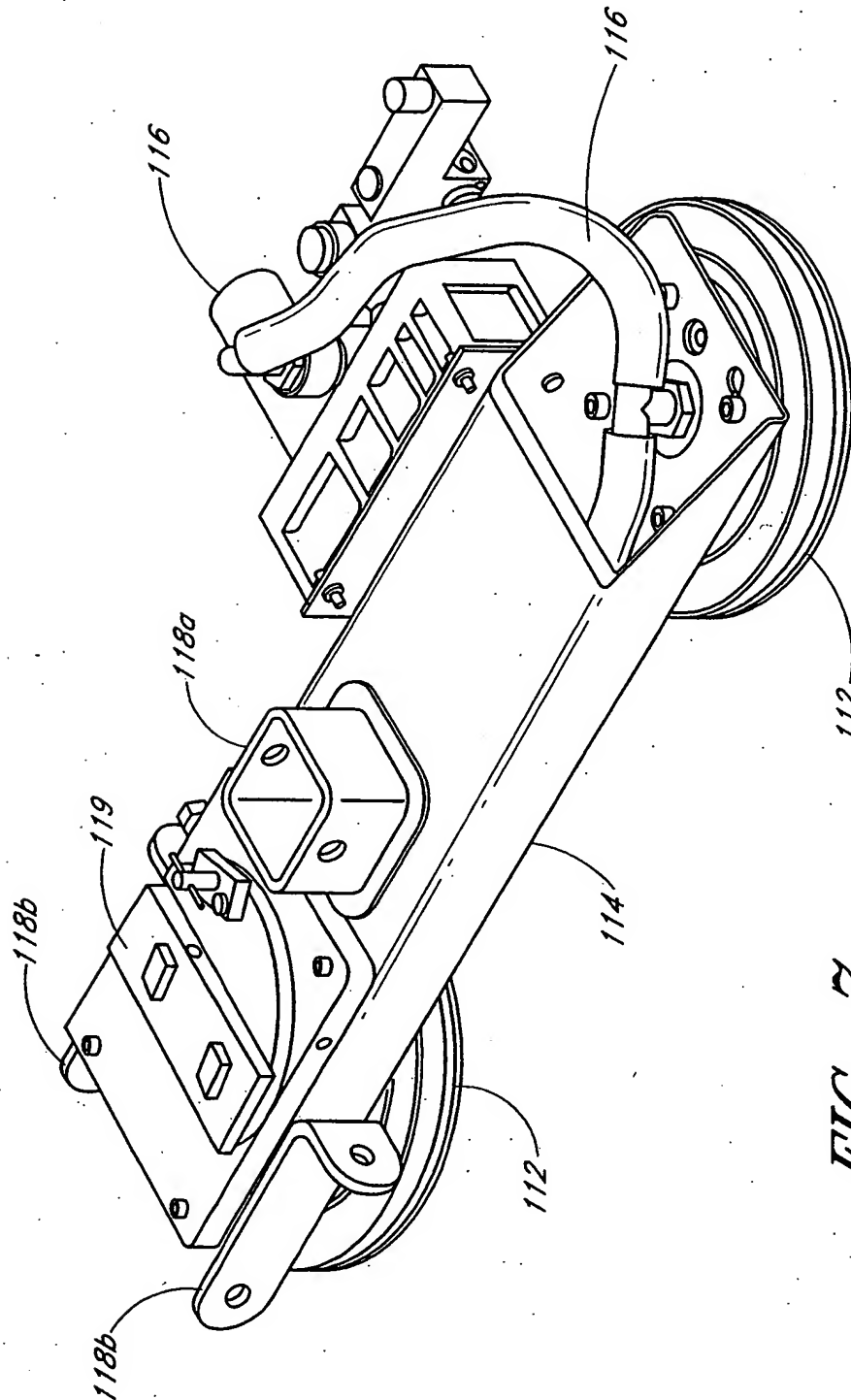


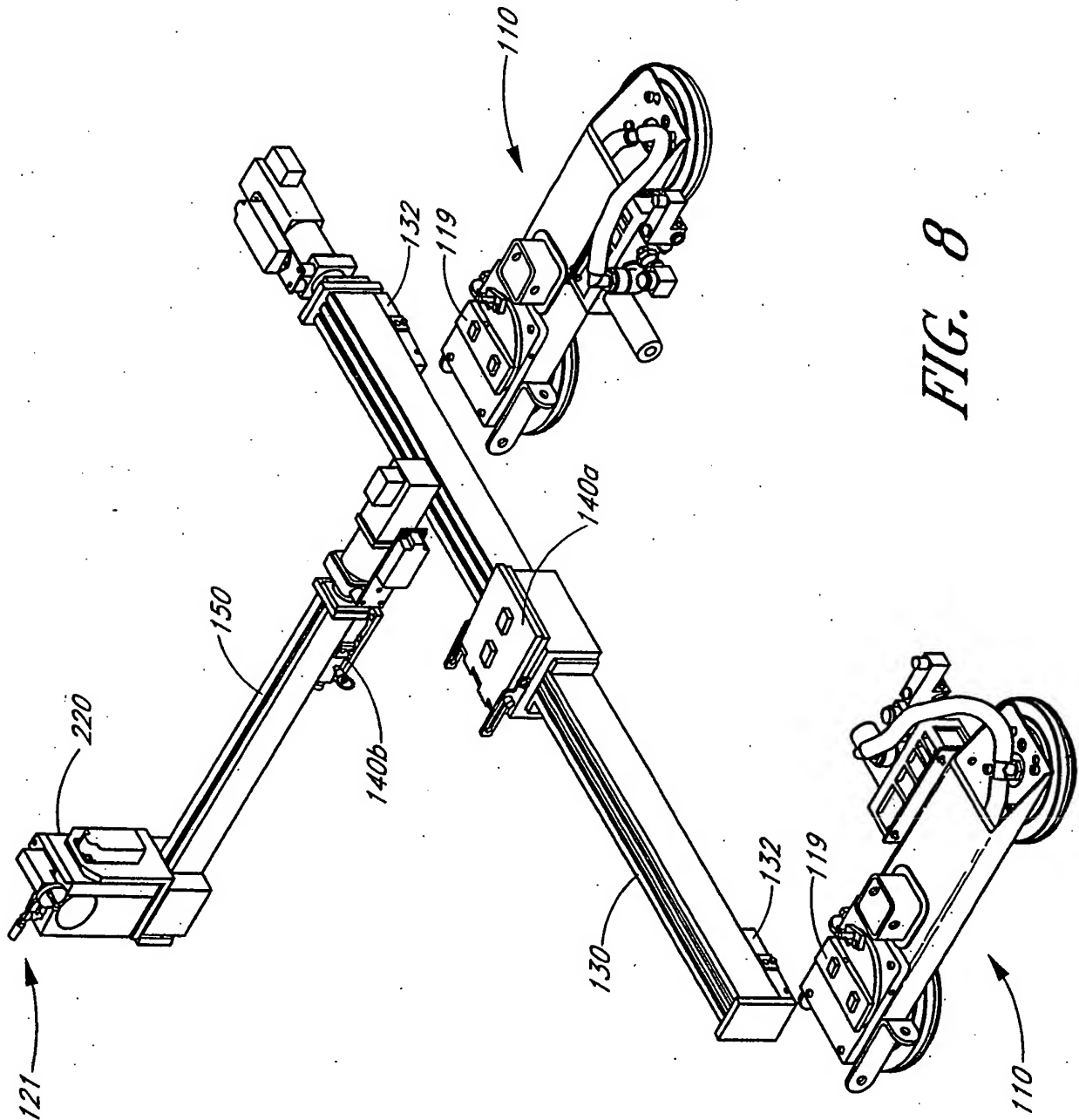
FIG. 7

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
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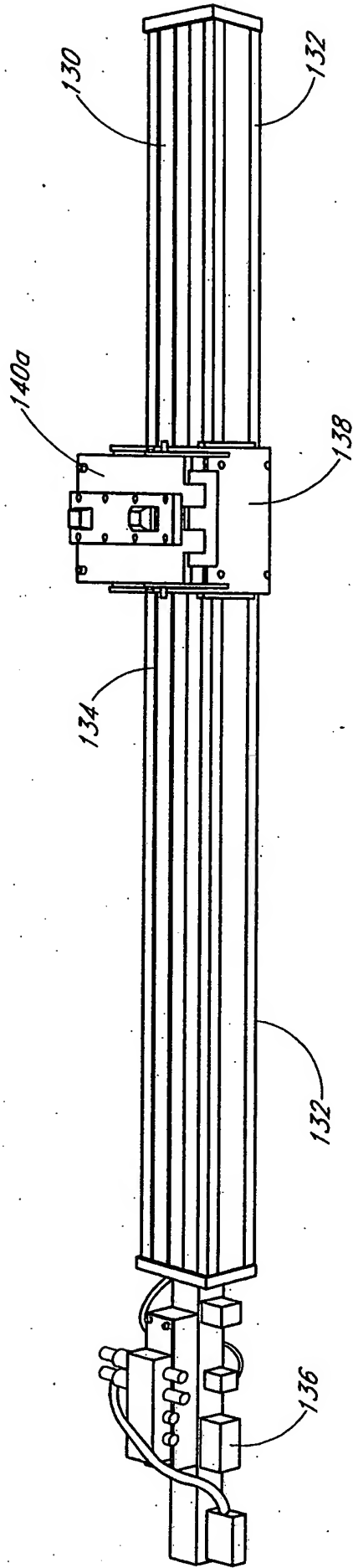


FIG. 9

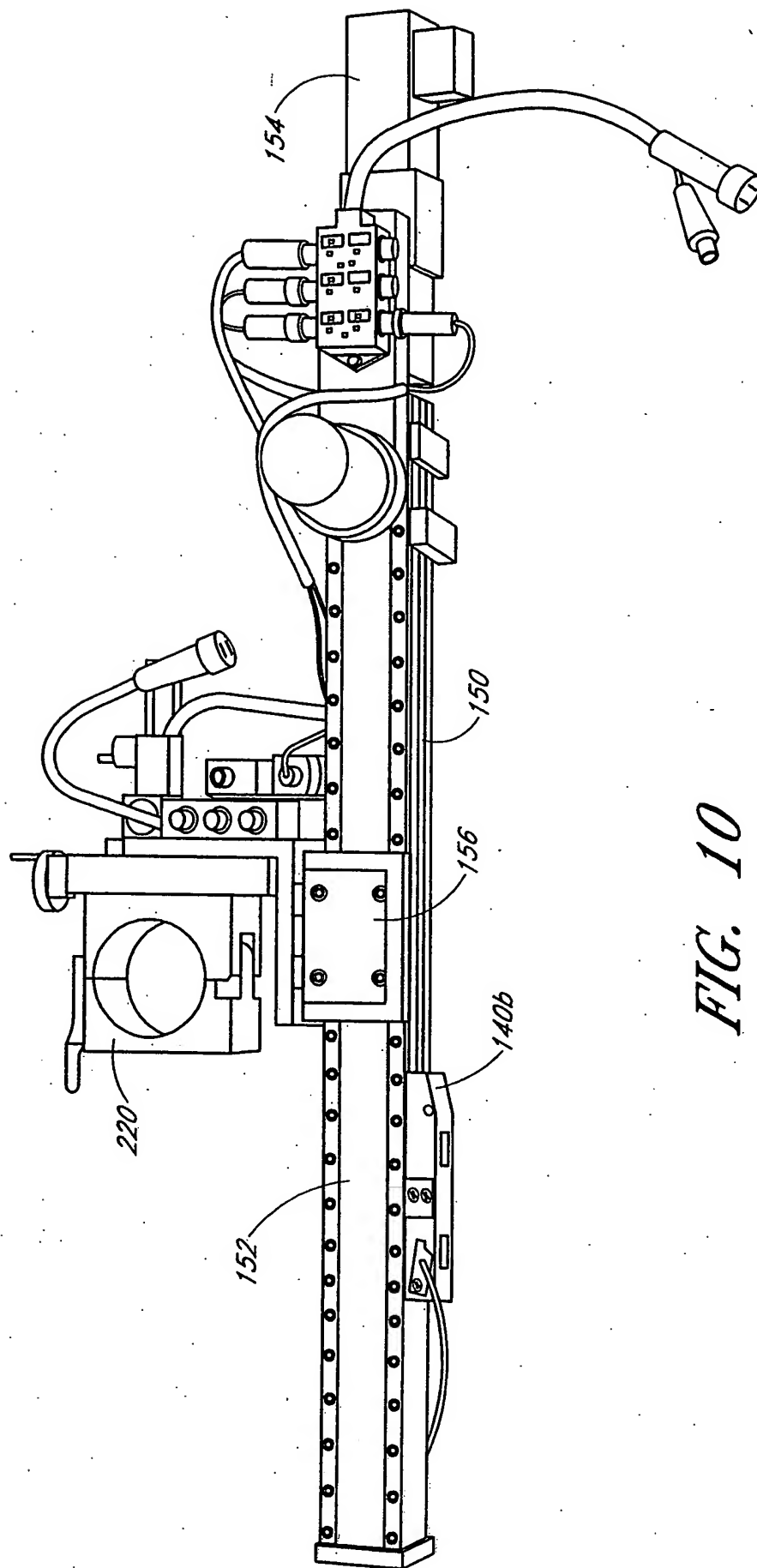


FIG. 10

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
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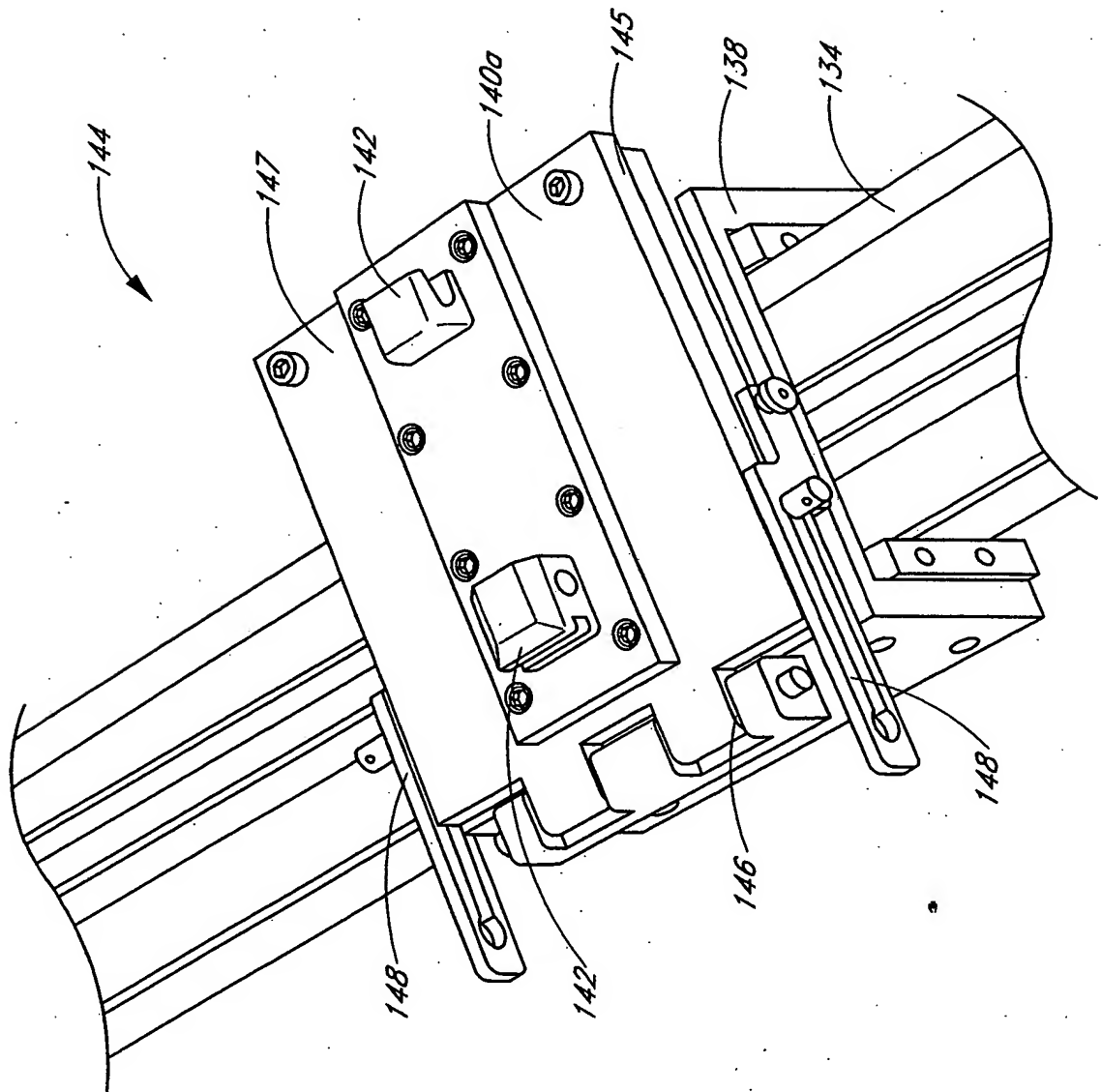
METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
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FIG. 11A



*METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
IRRADIATED WITH LASER LIGHT*

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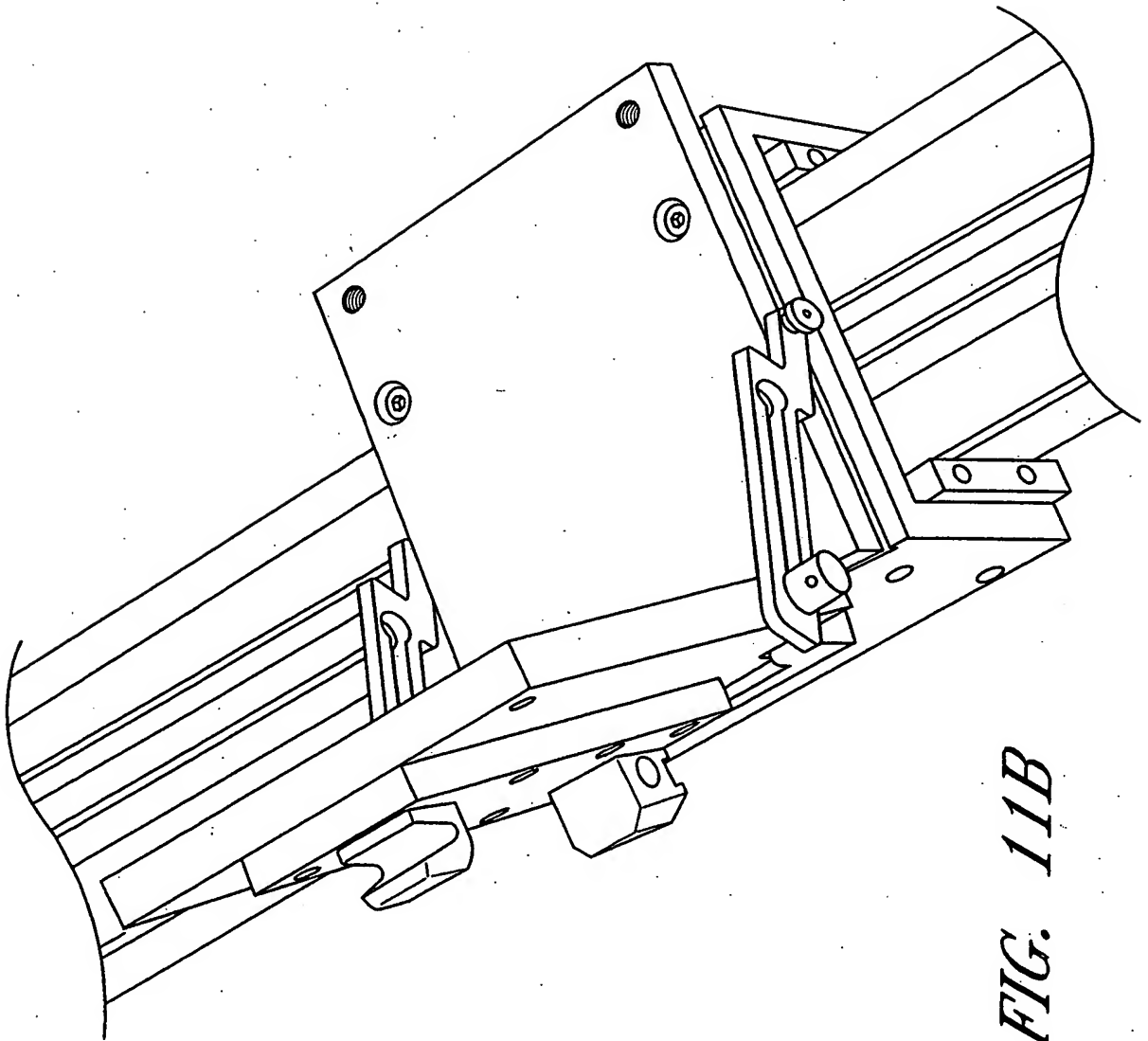


FIG. 11B

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
IRRADIATED WITH LASER LIGHT

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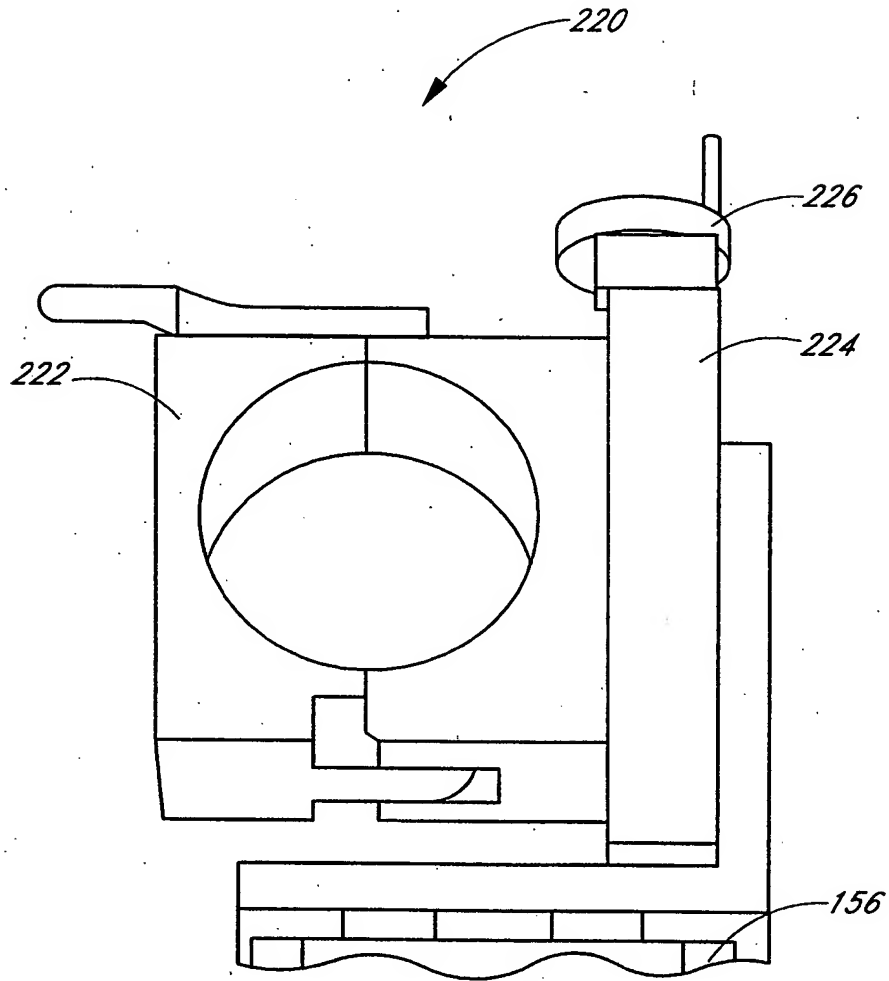


FIG. 12

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR WITHIN AN INTERACTION REGION OF A STRUCTURE IRRADIATED WITH LASER LIGHT

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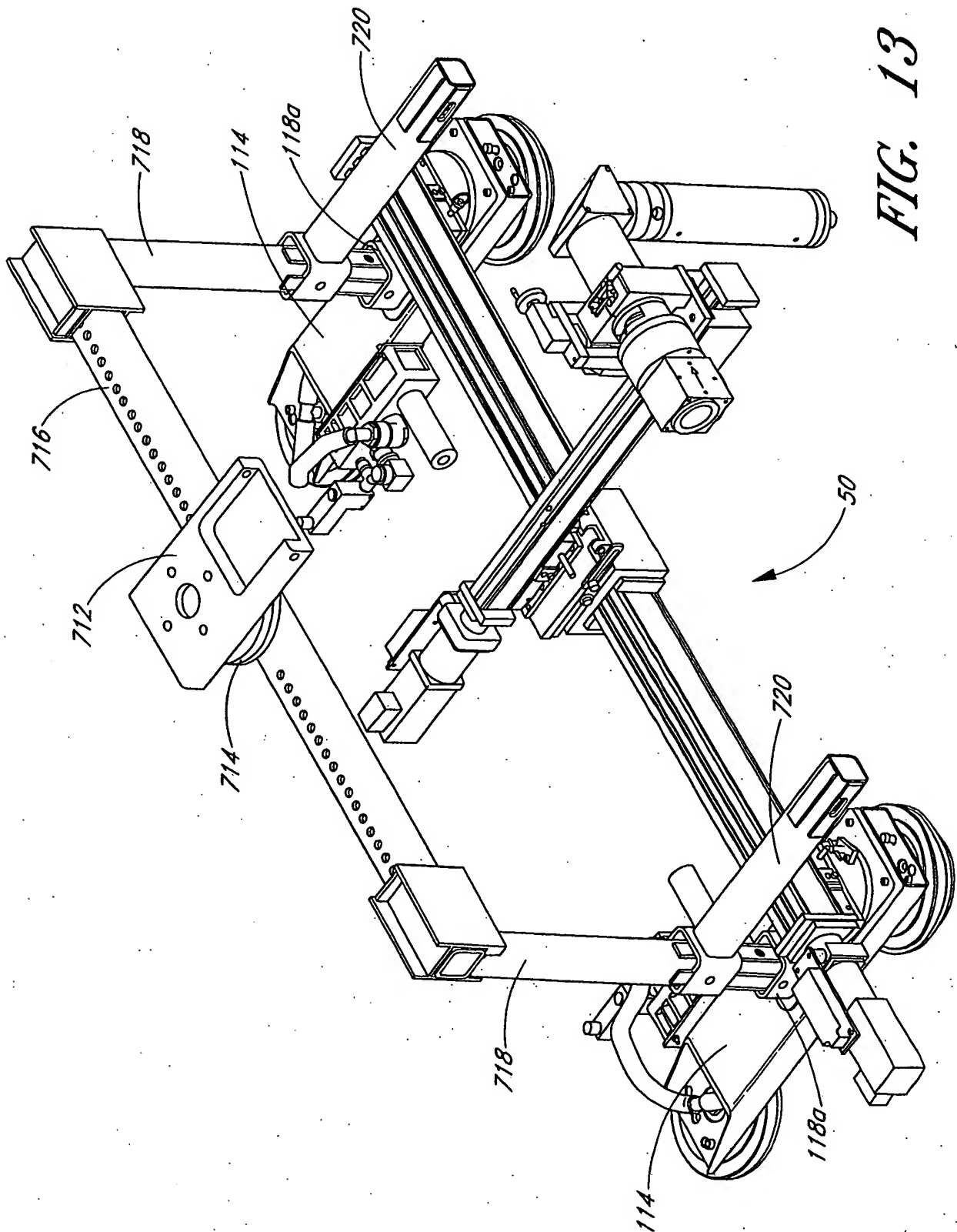


FIG. 13

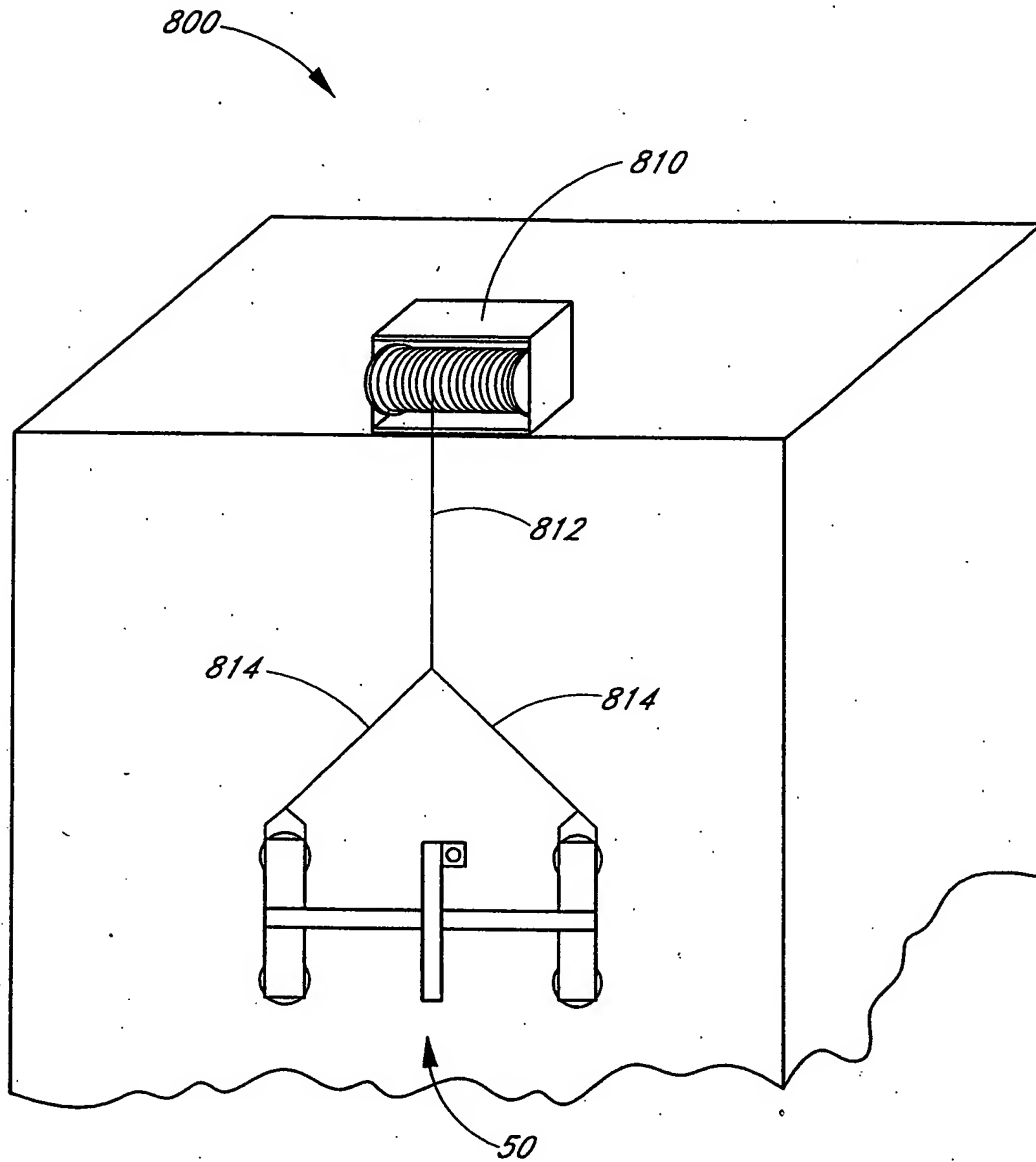


FIG. 14A

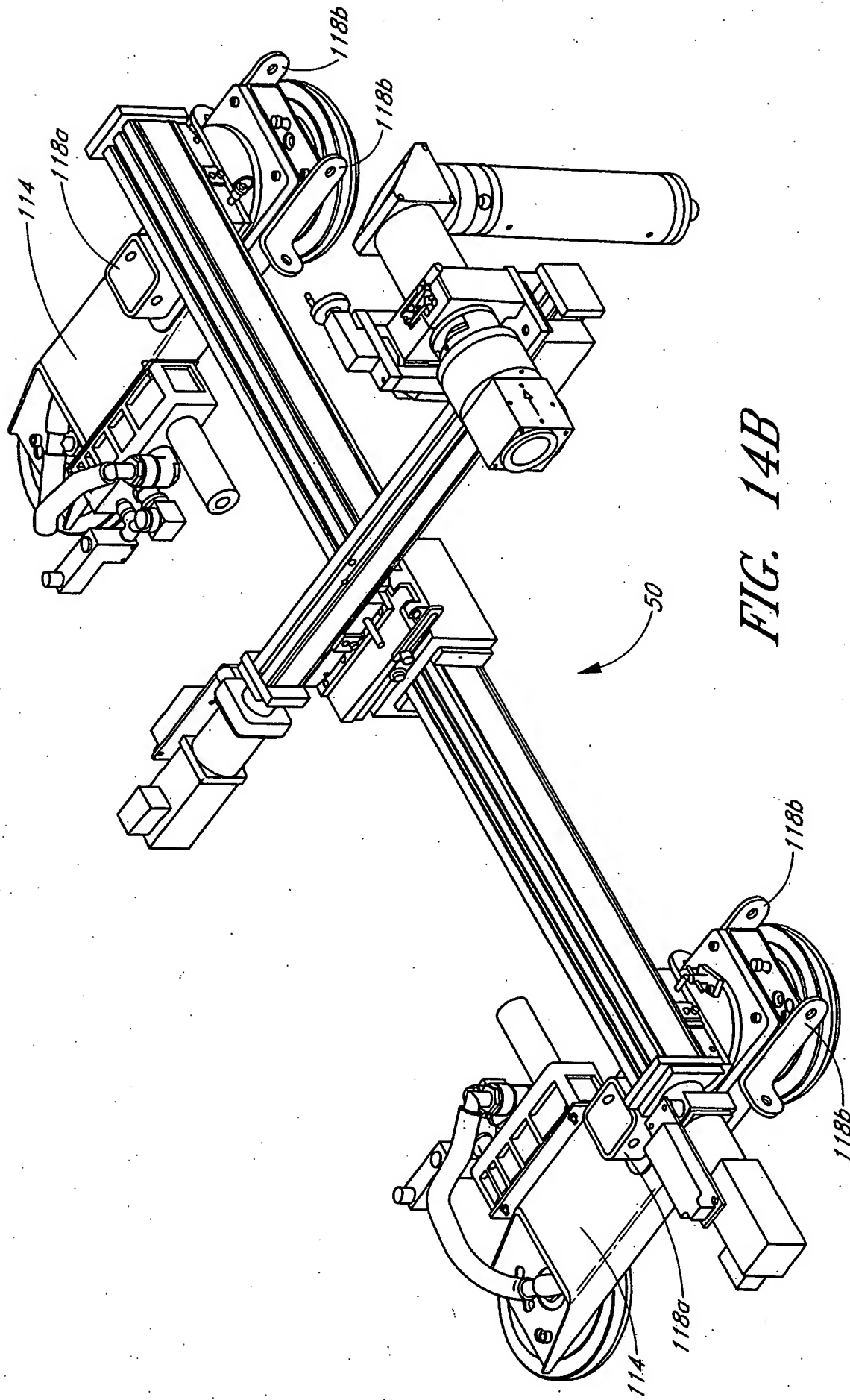


FIG. 14B

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
IRRADIATED WITH LASER LIGHT

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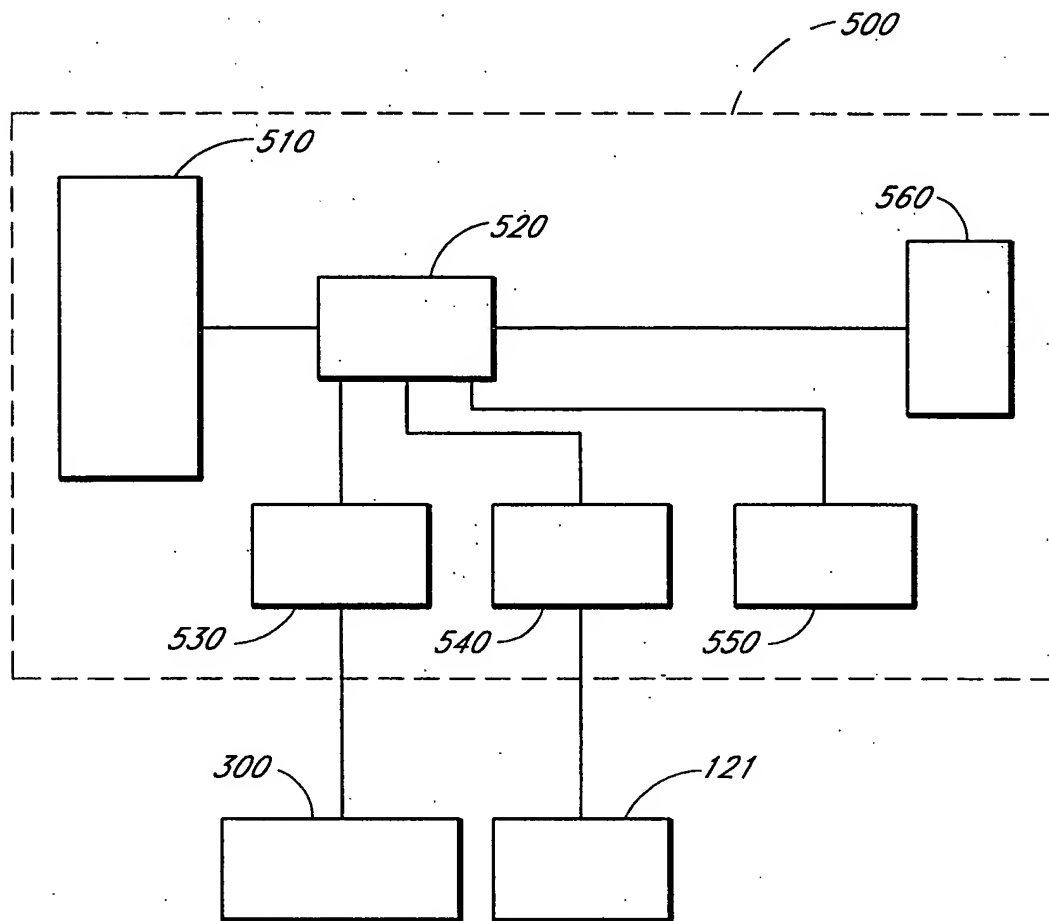


FIG. 15

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
IRRADIATED WITH LASER LIGHT

Inventors: Paul E. Denney et al Filed.: March 18, 2004

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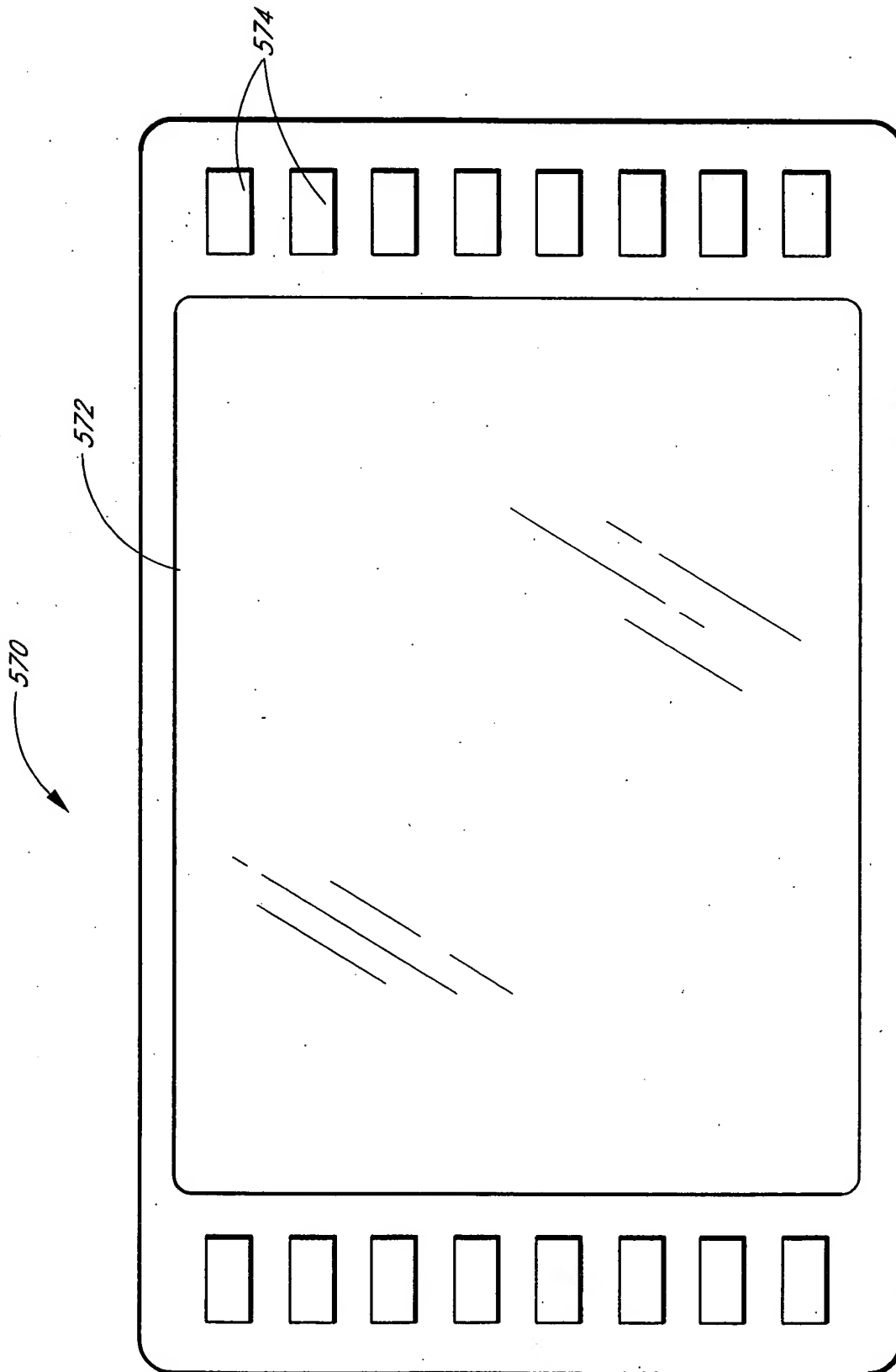


FIG. 16

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
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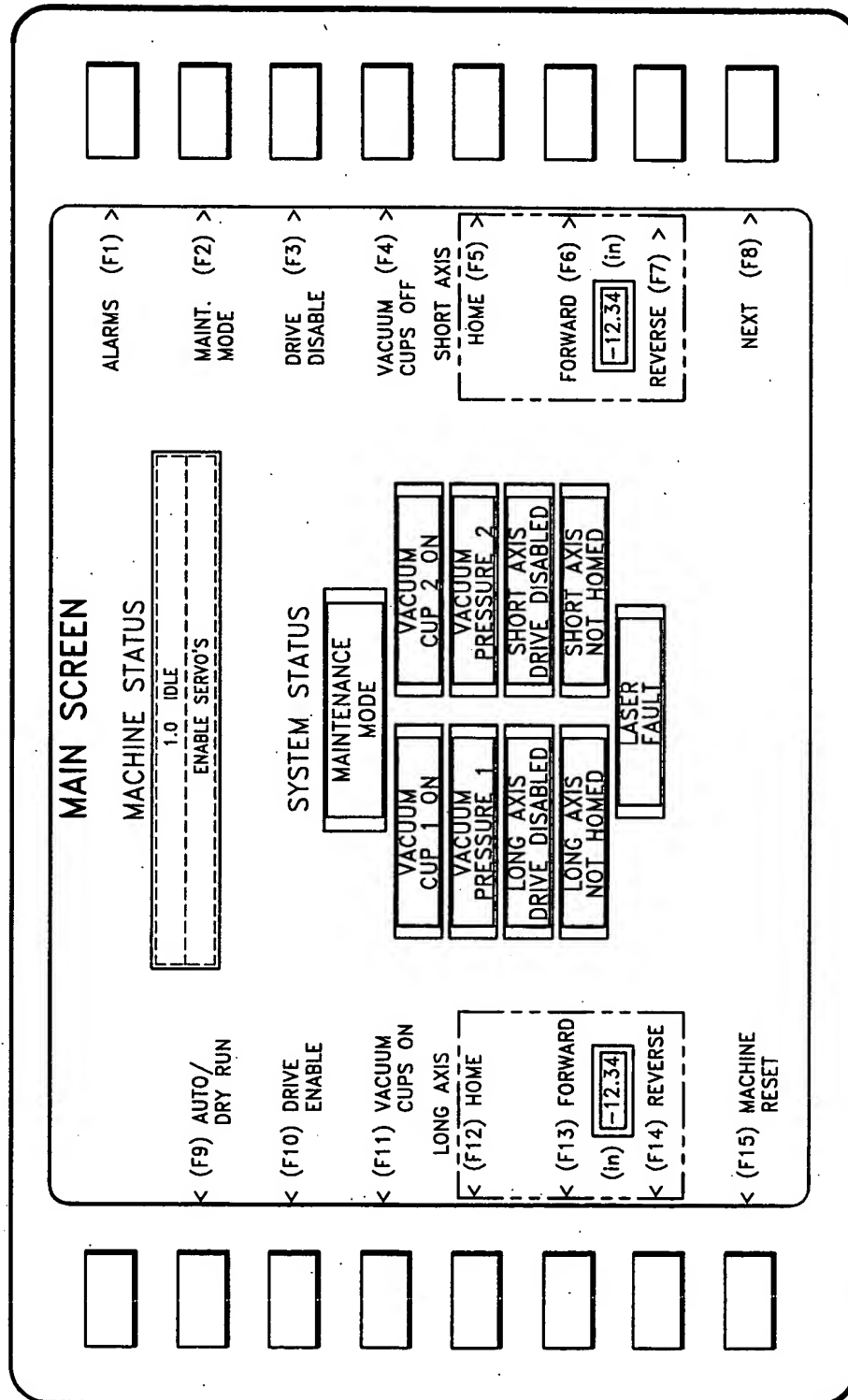


FIG. 17A

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
IRRADIATED WITH LASER LIGHT

Inventors: Paul E. Denney et al Filed.: March 18, 2004

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SELECT OPERATION SCREEN

< (F9) AUTO/
DRY RUN

MACHINE STATUS

1.0 IDLE
ENABLE SERVO'S

< (F11) CIRCLE

LONG AXIS
POSITION

-12.34 (in)

< (F12) PIERCE

SYSTEM STATUS

MAINTENANCE
MODE

< (F13) STRAIGHT CUT

SHORT AXIS
POSITION

-12.34 (in)

< (F14) SURFACE
KEYING

CIRCLE
IDLE

< (F15) MACHINE
RESET

PIERCE
IDLE

STRAIGHT CUT
IDLE

SURFACE KEYING
IDLE

NEXT (F8) >

FIG. 17B

Inventors: Paul E. Denney et al **Filed.:** March 18, 2004
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CIRCLE SETUP/OPERATION SCREEN

MACHINE STATUS

1.0 IDLE
 ENABLE SERVO'S

< (F9) AUTO/
DRY RUN

CIRCLE STATUS

2.0 CIRCLE SEQUENCE IDLE
 PRESS CYCLE START TO BEGIN

< (F11) CYCLE
START

SYSTEM STATUS

MAINTENANCE
MODE

< (F15) MACHINE
RESET

SHORT AXIS
POSITION

-12.34 (in)

CYCLE (F4) >
STOP

CIRCLE PARAMETERS

LONG AXIS
POSITION

-12.34 (in)

DIAMETER (in)

STATUS -1.234
 SET POINT -1.234

TIME (sec)

STATUS 1234
 SET POINT 1234

LBU
PROGRAM NUMBER

REVOLUTIONS

STATUS 1234
 SET POINT 1234
 COUNT 123

SPEED (in/min)

STATUS 12
 SET POINT 12

NEXT (F8) >

FIG. 17C

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
 WITHIN AN INTERACTION REGION OF A STRUCTURE
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PIERCE SETUP/OPERATION SCREEN

< (F9) AUTO/
DRY RUN

< (F11) CYCLE
START

< (F15) MACHINE
RESET

MACHINE STATUS

1.0 IDLE

ENABLE SERVO'S

PIERCE STATUS

3.0 PIERCE SEQUENCE IDLE

PRESS CYCLE START TO BEGIN

SYSTEM STATUS

MAINTENANCE
MODE

LONG AXIS
POSITION

-12.34 (in)

SHORT AXIS
POSITION

-12.34 (in)

PIERCE PARAMETERS

TIME (sec)

STATUS 1234

SET POINT 1234

PROGRAM NUMBER

STATUS 12

SET POINT 12

CYCLE (F4) >
STOP

NEXT (F8) >

FIG. 17D

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
IRRADIATED WITH LASER LIGHT

Inventors: Paul E. Denney et al Filed.: March 18, 2004

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CUT SETUP/OPERATION SCREEN

MACHINE STATUS

1.0 IDLE
ENABLE SERVO'S

CUT STATUS

4.0 CUT SEQUENCE IDLE
PRESS CYCLE START TO BEGIN

SYSTEM STATUS

MAINTENANCE
MODE

CUT PARAMETERS

	SPEED (in/min)	LENGTH (in)	PROGRAM NUMBER
LONG AXIS POSITION [-12.34] (in)	STATUS [-12.34] SET POINT [-12.34]	STATUS [-12.34] SET POINT [-12.34]	STATUS 12 SET POINT 12
SHORT AXIS POSITION [-12.34] (in)			

< (F9) AUTO/
DRY RUN

< (F11) CYCLE
START

< (F13) LONG
AXIS

< (F14) SHORT
AXIS

< (F15) MACHINE
RESET

LONG AXIS
NOT SELECTED

SHORT AXIS
NOT SELECTED

LONG AXIS
NOT SELECTED

SHORT AXIS
NOT SELECTED

NEXT (F8) >

FIG. 17E

SURFACE KEYING SETUP/OPERATION SCREEN

MACHINE STATUS

1.0 IDLE
ENABLE SERVO'S

SURFACE KEYING STATUS

5.0 KEYING SEQUENCE IDLE
PRESS CYCLE START TO BEGIN

SYSTEM STATUS

MAINTENANCE
MODE

LONG AXIS POSITION
[-12.34] (in)

PROGRAM NUMBER
STATUS [12]
SET POINT [12]

SHORT AXIS POSITION
[-12.34] (in)

LONG AXIS LENGTH (in)
STATUS [-12.34]
SET POINT [-12.34]

SPEED (in/min)
STATUS [-12.34]
SET POINT [-12.34]

OFFSET (in)
STATUS [-12.34]
SET POINT [-12.34]

< (F9) AUTO/
DRY RUN

< (F11) CYCLE
START

< (F15) MACHINE
RESET

CYCLE (F4) >
STOP

NEXT (F8) >

FIG. 17F

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FIG. 17G.

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
IRRADIATED WITH LASER LIGHT

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MAINTENANCE SCREEN

WARNING:
OPERATION FROM THIS SCREEN
BYPASSES SYSTEM INTERLOCKS

SYSTEM STATUS

MAINTENANCE
MODE

VACUUM
CUP 1 ON

VACUUM
CUP 2 ON

VACUUM
PRESSURE 1

VACUUM
PRESSURE 2

LONG AXIS
DRIVE DISABLED

SHORT AXIS
DRIVE DISABLED

LASER AIR
SOLENOID OFF

LASER AIR
PRESSURE

LONG AXIS
NOT HOMED

SHORT AXIS
NOT HOMED

LASER
FAULT

JOG SPEED
(in/min)

STATUS -12.34
SET POINT -12.34

LASER
FAULT

JOG SPEED
(in/min)

< (F9) AUTO/
DRY RUN

< (F10) DRIVE
ENABLE

< (F11) VACUUM
CUPS ON

LONG AXIS
< (F12) HOME

< (F13) FORWARD
(in)

< (F14) REVERSE

< (F15) MACHINE
RESET

ALARMS (F1) >

LASER AIR (F2) >
ON/OFF

DRIVE (F3) >
DISABLE

VACUUM (F4) >
CUPS OFF

SHORT AXIS
HOME (F5) >

FORWARD (F6) >
(in)

REVERSE (F7) >
(in)

NEXT (F8) >

FIG. 17H

METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
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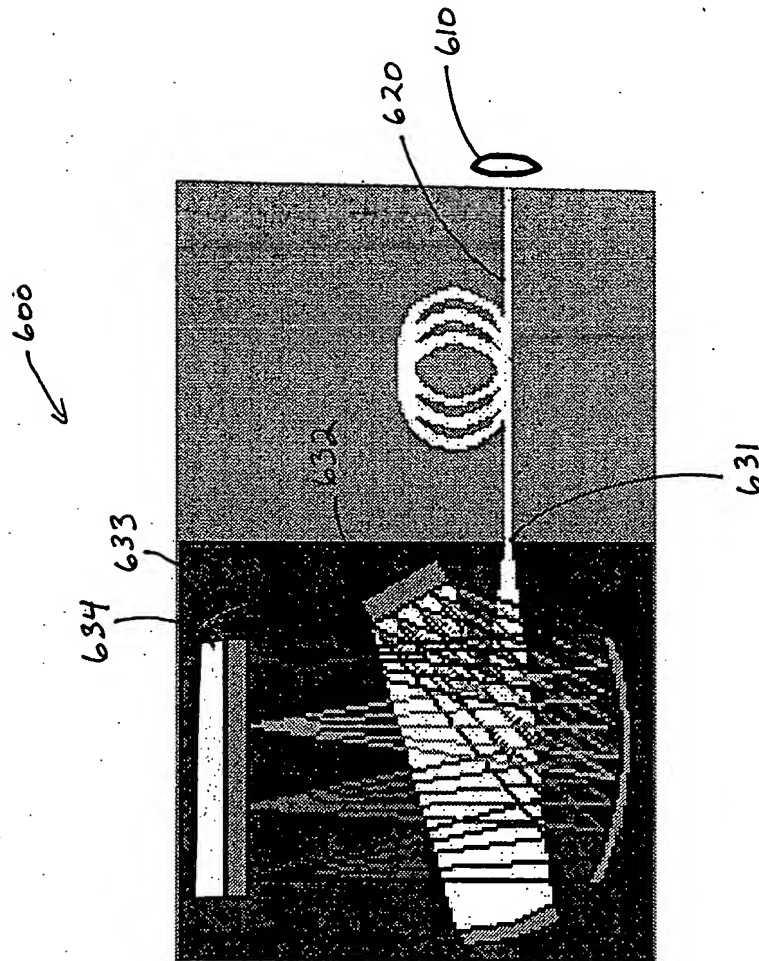


Figure 18A:

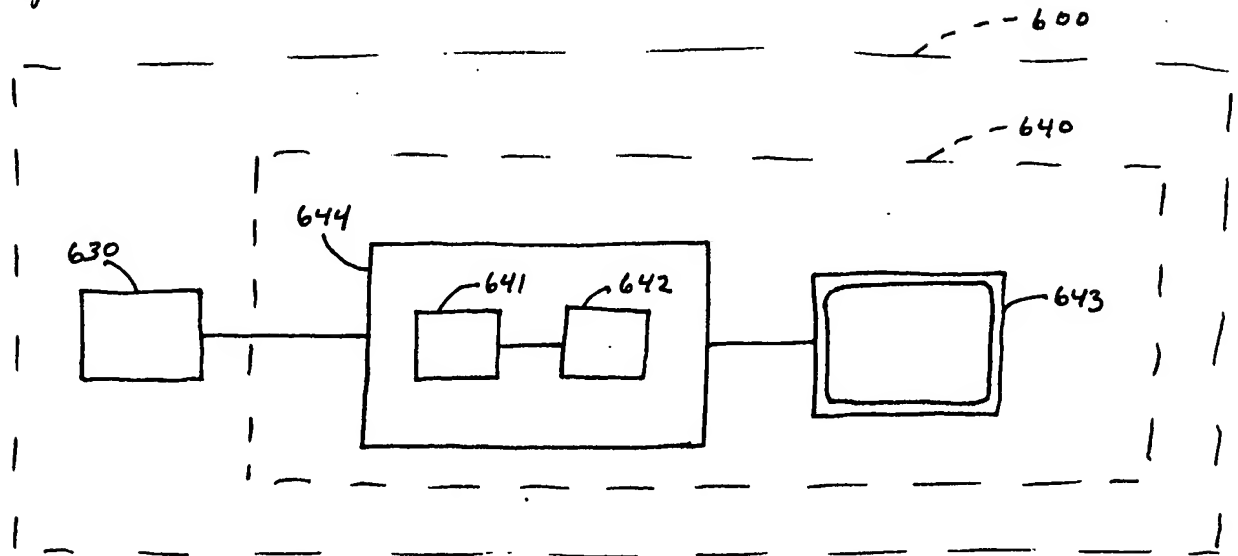
METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
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Figure 18B:



METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
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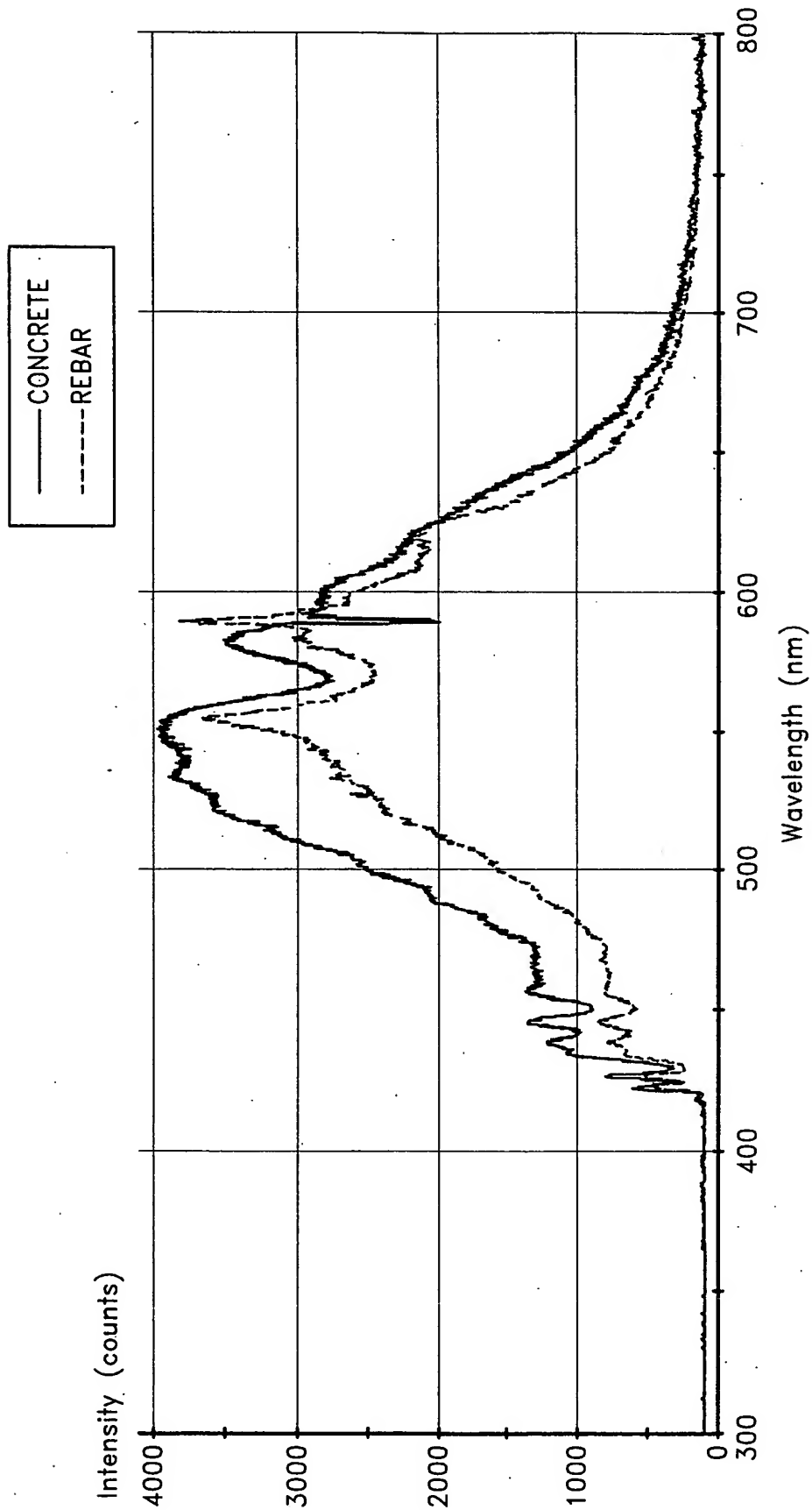


FIG. 19

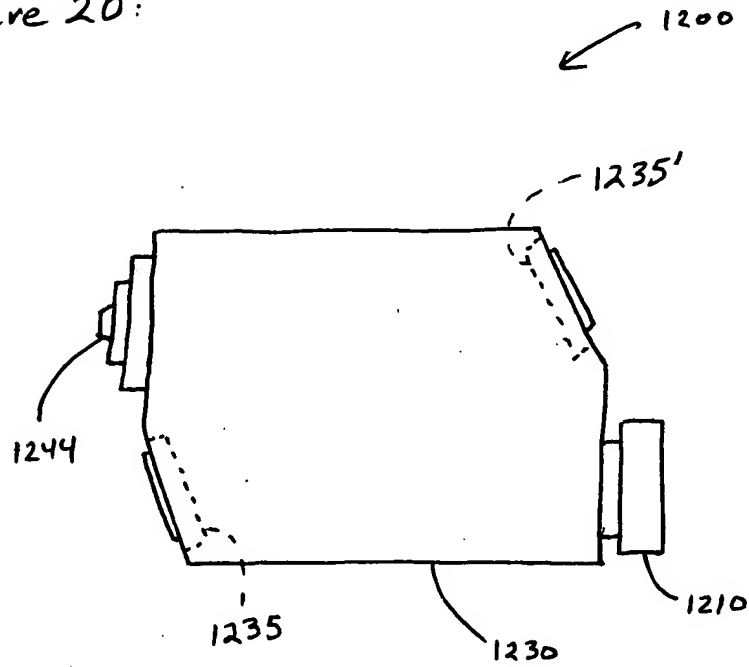
METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
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Inventors: Paul E. Denney et al Filed.: March 18, 2004

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Figure 20:



METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
WITHIN AN INTERACTION REGION OF A STRUCTURE
IRRADIATED WITH LASER LIGHT

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Figure 21A:

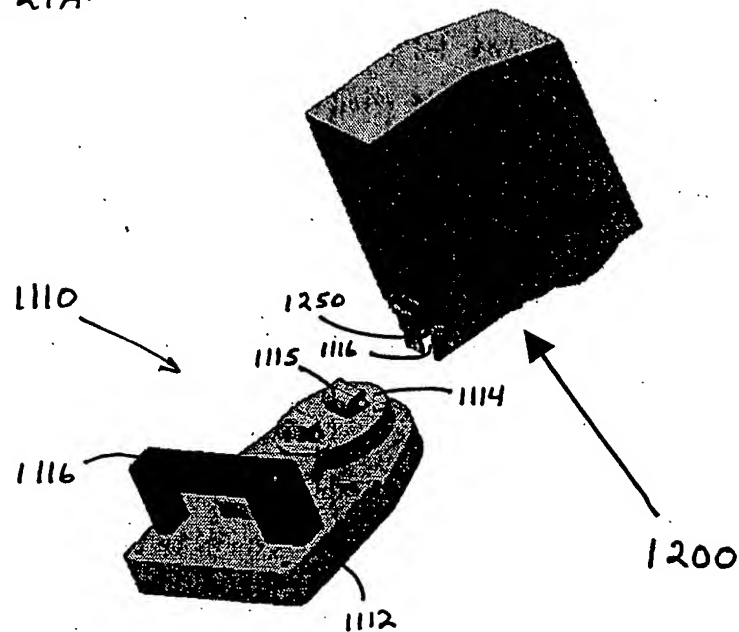
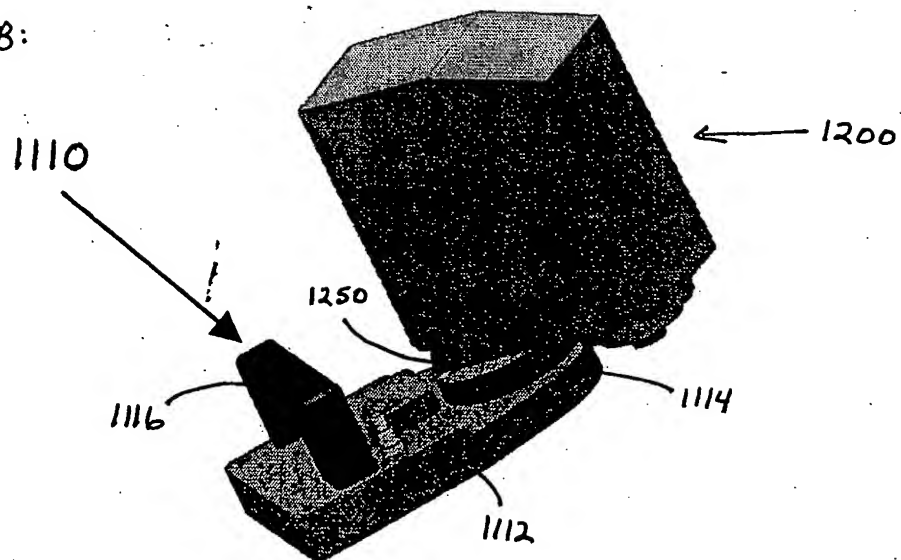


Figure 21B:



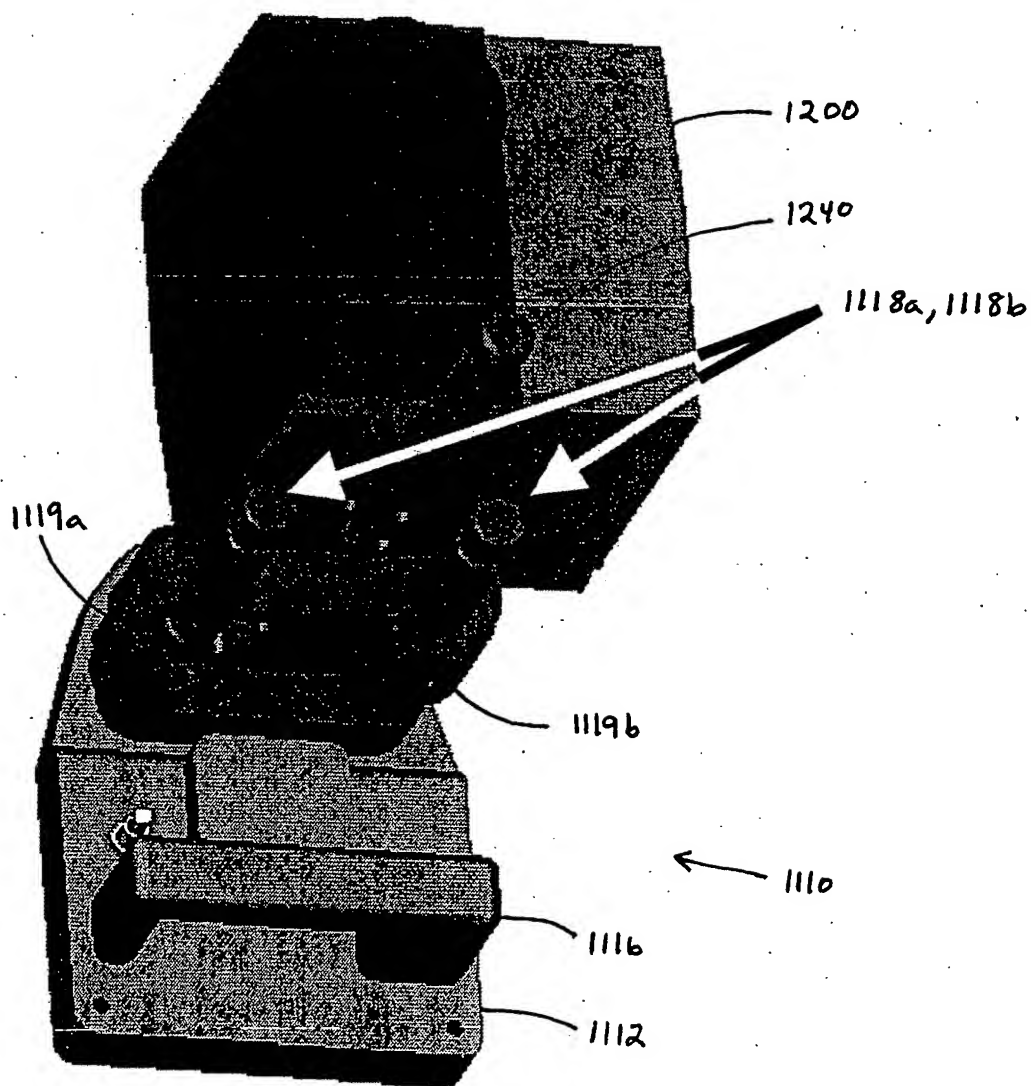
METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
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Figure 21C:



METHOD AND APPARATUS FOR DETECTING EMBEDDED REBAR
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IRRADIATED WITH LASER LIGHT

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Figure 210:

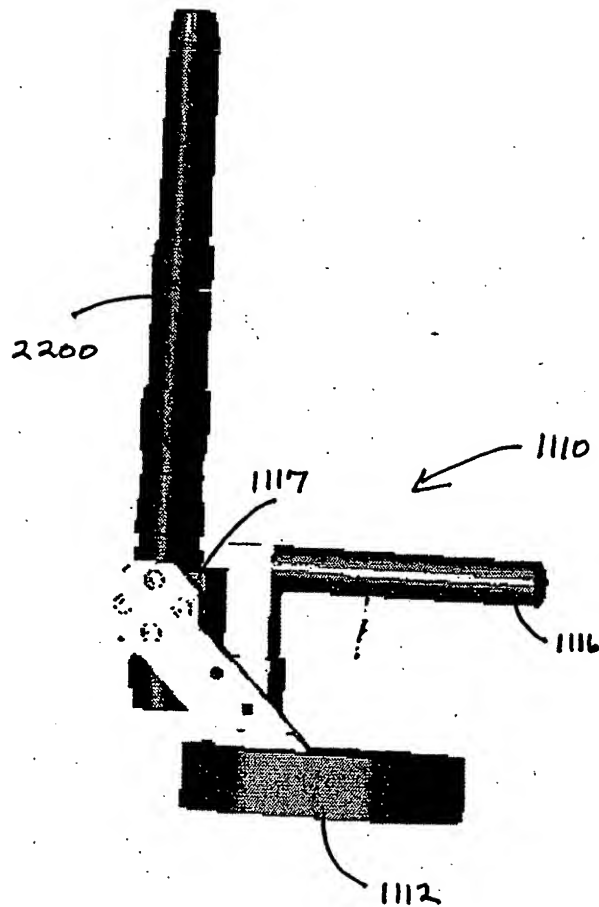


Figure 22:

